NASA STTR 2016 Phase I Solicitation

T15.01 Power Systems for Hybrid Electric Propulsion

Lead Center: GRC

Proposals are sought which support the technology development of power systems for aircraft hybrid electric propulsion. Hybrid electric propulsion systems, involving distributed propulsion provided by an electric power system, requires the integration of propulsion, electric power, and aerodynamics.

Distributed propulsion systems using electric motor driven fans, with power electronics used for voltage and frequency control, and having peak load equal to the total power generation provides unique challenges associated with the power system control and protection methods. The nonlinear, constant power propulsor loads also complicate the stable operation of the power control, and the limited capacity of the generators complicates the protection system and recovery control following faulted operation. Proposals addressing the power management and stability issues inherent in these kinds of power systems, and the power control methods that can be exploited to enable the power system for distributed hybrid electric propulsion are needed.

The inclusion of electric power for distributed propulsion, with much faster dynamics, also requires innovative methods for simulation of the integrated system. Advanced hybrid (algebraic and dynamic) power system simulations using load flows methods in conjunction with dynamics as needed to allow for an integrated simulation capability are also of interest.

New approaches for advanced power electronic switching devices that go beyond wide band gap semiconductors and utilize graphene or carbon nanotubes, and added manufacturing methods that can be utilized to manufacture an integrated electro-magnetic and electrical structure for electric machines are also of interest.